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Deposited in DRO:

14 September 2015

Version of attached file:

Accepted Version

Peer-review status of attached file:

Peer-reviewed

Citation for published item:

Siddiqui, N. and Gorard, S. and See, B. H. (2015) 'Accelerated Reader as a literacy catch-up intervention during primary to secondary school transition phase.', *Educational review.*, 68 (2). 139-154 .

Further information on publisher's website:

<http://dx.doi.org/10.1080/00131911.2015.1067883>

Publisher's copyright statement:

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Accelerated Reader as a literacy catch-up intervention during primary to secondary school transition phase

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Abstract

This paper describes an evaluation of an internet-based reading programme called Accelerated Reader (AR), which is widely used in UK schools and worldwide. AR is a whole-group reading management and monitoring programme that aims to stimulate the habit of independent reading among primary and secondary age pupils. The evaluation involved 349 pupils in Year 7 who had not achieved secure National Curriculum Level 4 in their Key Stage 2 results for English, randomised to two groups. The intervention group of 166 pupils was exposed to AR for 20 weeks, after which they recorded higher literacy scores in the NGRT post-test than the control group of 183 pupils ('effect' size of +0.24). The schools led the organisation and implementation of the intervention, and also conducted most elements of the evaluation, with advice from an expert external evaluation team. The process evaluation suggests that these schools were very capable of conducting evaluations of their own practice, given appropriate guidance.

Key words: Accelerated Reader, technology, evaluation, literacy, reading, catch-up, transition

Introduction

Accelerated Reader (AR) is a widely used web-based intervention produced by the Renaissance Learning Company, which monitors and manages pupils' reading practices and encourages them in independent reading. The intervention is described in detail later in the paper. The paper first presents some of the prior evidence of the effectiveness of AR, the methods used in this new evaluation, and the results in terms of process and impact. The paper ends by considering the implications for encouraging literacy at the transition from primary to secondary school, and for the role of schools and teachers in conducting evaluations of their own practice.

In the UK, over 2,000 schools are using AR on a regular basis, which means that well over 400,000 students are reading what is recommended in AR or what AR supports through quizzes (Topping 2014). However, it is not clear that the implementation of AR at such a large scale can be justified solely on the basis of the existing evidence of effectiveness.

In addition to simple snapshot surveys suggesting that AR participants read more than other pupils (Clark 2013), there have been several small and weak intervention studies reporting success for AR. For example, Scott (1999) involved only 28 pupils (from a larger number approached), had unbalanced groups at the outset, and the report is unclear how the cases were allocated to AR or not. There are also studies showing no effects or even negative impact. Mathis (1996) compared the progress of 37 AR pupils (from a larger number

approached) over one year with the whole year cohort, using the Stanford Achievement Test. There was a large negative effect size for AR pupils on reading comprehension.

AR is one of 24 reading interventions listed by the What Works Clearinghouse (WWC) (IES 2008). According to the findings of their systematic review, AR has no visible effect on reading fluency, a mixed effect on comprehension and a possible positive effect on reading achievement (WWC 2008). These results are based on only two studies that fulfilled WWC standards for systematic reviews.

In one study, 45 teachers (with 572 K-3 grade students, aged 11-14, in 11 schools) were randomised to teach using AR or another commercially available reading programme (Ross et al. 2004). The results were calculated after one year. The authors reported what they termed a 'significant' impact on reading comprehension using the STAR reading test, but WWC recalculated and reported that they found it was not statistically significant, although the effect size was over 0.25. Similarly, there was no significant effect on general reading achievement based on the STAR Early Literacy test for each year group, but the overall effect size was over 0.25. Also, the STAR tests are produced and marketed by Renaissance Learning as part of the AR programme itself (<http://www.renlearn.co.uk/accelerated-reader/reports-and-data/>). They should, therefore, not be regarded as independent assessments (Krashen 2007). The second study involved only 32 grade 3 students attending one school in the Pacific Northwest (Bullock 2005). They were individually randomised to receive 90 minutes of AR reading or not per week for 10 weeks. At the end there was no difference in terms of oral reading fluency. As above, the author reports no 'significant' effect on reading comprehension using the STAR reading test, but the effect size is greater than 0.25.

Brooks (2007) conducted a meta-synthesis of UK studies involving reading interventions for pupils with reading difficulties. The meta-synthesis for AR found 47 studies conducted mostly in the US, but only two were selected for inclusion (Vollands et al. 1996, 1999). According to the reports, AR produced positive effects. However, the cell sizes in comparison were only 11 in one study and 12 in the other. This is too small to draw conclusions on the effectiveness of the intervention. It is not clear how the groups had been created, nor whether baseline equivalence was established between the treatment and control groups. And anyway in tests three months later, the control group had made more progress.

A more recent study was conducted with 108 primary age pupils from two schools in the US (Nichols 2013). Pupils were randomly allocated to AR in one (treatment) school, and to a literacy plan in the other (control) school. After one year, there was no difference (or rather a small negative effect of -0.02) between the two groups in terms of the Standards of Learning (SOL) test. In contrast, an even more recent study in the US was based on 19 teachers randomly allocated to AR or not (Shannon et al. 2015). The study reported a positive impact for the AR group. However, the groups were not balanced at the outset with the treatment group having markedly lower prior test scores. Their subsequent improvement might be a sign of regression to the mean. The outcome measure used in the study was the STAR reading test, which is an integral part of the AR intervention itself – meaning that those in the treatment group had more practice at this kind of test.

There have been some larger studies, all with weaker designs and non-random allocation of cases (and are incorrect in using the concept of 'significance' in determining differences between groups). For example, Paul et al. (1996) had a large sample of 6,000 schools in which 58 percent were non-AR comparison schools in similar geographic locations.

According to official records, the schools having access to AR had better pupil attendance records and reading performance scores compared to the schools not using AR. A similar study, based on schools that had already adopted AR or not was conducted by Peak and Dewalt (1993), who reported greater success for the AR group at both primary and secondary levels. Pavonetti et al. (2000) developed a test to measure the quantity of books read, called the Title Recognition Test (TRT). Pupils were asked to mark the book titles they had read and in order to check if they were guessing rather than giving true responses, some foils for book names were added in the list (25 titles were actual books and 16 were foils for book names). AR claims that pupils' quantity of book reading increases if they use AR in schools. This claim was assessed using a school -level matched comparison design, with 10 secondary schools. There was no difference in the quantity of reading between the pupils using AR and those not using AR (reported mean difference was -.008). See also Pavonetti et al. (2003). Goodman (1999) involved 282 pupils in one US secondary school with no comparator, and claimed a positive gain based on pre- and post-test only. Using a small sample, Facemire (2000) reported gains of five months for AR pupils compared to gains of only three months for comparison group on the STAR reading comprehension test. However, given that the STAR comprehension test is part of the AR programme, the test is intervention specific, and may be practised more often by the intervention group.

Rudd and Wade (2006) used matched comparison schools, and found that the average gains in reading from not using AR were greater than for the intervention schools (their Table 2.6, p.13), but this finding appears neither in their summary nor their conclusion. Instead, the authors reported that it needs "to be emphasised that there were improvements in average standardised test scores in the treatment schools for mathematics (both secondary and primary) and in the primary schools for reading. These were not spectacular improvements, but they can be seen as an important step in the right direction" (p.51). The authors do not report attrition clearly either at school or pupil level, but it is clear that the reading attainment results are based on only 11 schools of the 21 originally allocated.

Therefore, there is a considerable research base on AR, only some of which can be discussed here, making it one of the most researched interventions in which reading is practised through online resources. Prior research has mainly been carried out in the context of US schools. Also, the quality of the evidence on the effectiveness of AR on attainment is mixed, with much of the research small, high attrition, using AR-led measurements, or based on weak research designs. Much of it also shows no benefit from using AR anyway. Given that its use is widespread, there is therefore a role for a UK-based trial involving a larger sample, true random allocation, baseline equivalence between the two groups, an independent test of attainment, and complete process evaluation.

Methods of investigation

Design

This evaluation study is a two-arm, school-led, post-test-only design, individually randomised controlled trial in which four secondary schools participated. The target group of 349 pupils across four schools was selected on the basis of their prior KS2 scores and pupils at Level 4c and below in English were selected with an intention to treat.

The intervention itself was carried out from for 20 weeks.

Sample and group allocation

Four individual secondary schools proposed to conduct the intervention and evaluation of AR. The developers were not involved in any of these four proposals so it was decided that the schools should run the trial with advice from evaluators. Following this decision led to four individual trials conducted separately in the schools. The results across all four schools are aggregated for the final analysis. The schools involved were located at four different locations in the UK. In terms of their most recent OFSTED inspection one school received 'Good' while the other three had 'Required Improvement' grades.

One of the main research questions of the study was to investigate the impact of AR on pupils who have joined the secondary schools with borderline risk in attainment of English. Transition in the school is a challenging stage for the disadvantaged pupils and as well as for schools. The UK education policy have recently emphasised on finding robust evidence on initiatives that could possibly intervene in the trajectory of disadvantaged pupils towards failure (DfE 2012). Currently schools in the UK are using various literacy catch-up interventions but there is paucity of evidence with regards to effectiveness of literacy intervention during transition phase (See and Gorard 2014). The current study is one in the series of randomised controlled trials that mainly targeted at pupils' school transition phase (EEF 2012, Siddiqui et al. 2014). The findings of this RCT suggest that AR intervention could support pupils in achieving the expected targets in literacy. The targeted sample is exactly those pupils who were in the transition phase and were at risk of failure.

All schools were urban, mixed, secondary stage schools. The proportion of disadvantaged pupils was high in all four schools. The selection of 349 eligible pupils was made from scrutiny of nearly 2,500 pupils enrolled across the four secondary schools. In the final analysis, 8 pupils dropped out and could not be followed for the post-test. The reasons of drop-out were: left country, home schooled, and did not provide details of the destination school. According to the drop-out figures in the groups, 2 pupils were in the control group and 6 pupils were in the treatment group. The attrition is 2.3% of the total sample initially selected for the study. The average KS2 scores of those who dropped out in treatment and control groups was about the same, and neither unusually high nor low, given the eligibility criteria.

The pupil characteristics in the achieved sample are provided below (Table 1). No data are missing. In order to keep the pupil selection and group allocation procedures unbiased the following characteristics were assessed only after the randomisation procedure. The characteristics of the sample indicate that a majority of the pupils are in some major categories of the disadvantaged groups.

Table 1 - Number of pupils in each group with the listed background characteristics

	AR group	Control	Percentage of total sample
Male	100	83	52
Female	83	83	48
FSM	62	61	35
Non-FSM	121	105	65
SEN	46	36	23
Non-SEN	137	130	77

EAL	7	6	4
Non-EAL	176	160	96
Non-White	29	13	12
White British	154	153	88

This is a school-run trial in which the target sample was determined by individual schools. Initially the schools proposed a rough estimate of 450 pupils across all four schools which would traditionally be considered sufficient to detect a minimum effect size of around 0.27 (Lehr's approximation). The final figure was dependent on the KS2 results of the incoming cohort, and the eventual intake of pupils by these schools. The eventual sample included 349 pupils from four secondary schools located in different regions of the country. The selection criteria were pupils' KS2 scores and only were selected who were at Level 4c and below in KS2 English. The schools selected their target groups on arrival in Year 7. Three schools conducted individual pupil randomisation. One school randomised into treatment and control group by classes. The school that randomised classes had 119 pupils identified in the target group and they were already spread across different class groups (i.e. the usual classes for that school). The school claimed that it was not practically possible to individually randomise the pupils and conduct the intervention. The evaluators ran a separate group analysis for this school and found that the groups were well balanced in terms of KS2 scores before the intervention began (see Table 2 below).

No school dropped out from the trial and the pupil attrition rate was considerably lower than usual in large scale trials. By the end of intervention period consisted of 20 week 8 pupils had dropped out or could not be included in the analysis. The total attrition rate is just over 2% of the total sample identified as a target group. The pupil who were dropped-out were followed as missing cases and were tried to approach in the destination on schools all to complete the post-test. This step was followed as an essential measure for the completeness of results and findings of the study findings. Based on all the available information there was no observable pattern of bias or unbalance in the drop out cases. There were 6 pupils who completed the test as a result of following them to different schools.

The schools used simple methods such as taking the enclosed name from a pot which contained the enclosed name chits for the pupils. One school used a computer pseudo-random number generator and another used a shuffled pack of cards as demonstrated in the workshop. In each such method, the number of eligible cases and the number in each group were pre-determined. For example, schools were shown that there could be one card for each pupil, and red cards might mean treatment and black cards control. The cards were mechanically shuffled and then laid out in sequence next to the list of pupil names. The schools then sent the list of allocated groups to the evaluators to record, and started the intervention in September 2013. The evaluators did not observe the randomisation. The process of randomization appeared fair in this trial, despite taking place in each school separately. The evaluators also ran a simple analysis of the groups to check if the allocation was balanced in terms of KS2 scores in English.

Pupils in the waiting list continued the usual school activities. There was no chance of contamination because pupils in the control group had no access to the AR programme. However, the material purchased for the intervention was made available to everybody. The books, computers, iPads and tablets were not restricted to treatment pupils only. The pupils in the control group were assigned into a waiting list and the schools started AR with them any time after 20 weeks of the trial.

After selection of the target group, the schools themselves randomised the target group into two arms and began the intervention in September 2013. Baseline equivalence was established on the basis of prior KS2 scores. The evaluators advised the school leads on the process of randomisation, and checked after the randomisation that the two arms of the trial were initially balanced in terms of KS2 scores in English. The treatment group across all four schools received AR first and the pupils in the control group continued their regular school lessons. This was a waiting list design which did not deprive pupils of the treatment and associated resources after a specified time gap of 20 weeks pupils in the controlled group were free to receive AR. In terms of the cost of complete evaluation the post-test design is a cost-effective strategy in terms as only one test was involved after the intervention.

Testing

The New Group Reading Test (NGRT) is the third edition of Group Reading Test (GRT) developed by GL Assessment and the National Foundation for Education Research. The age appropriate level NGRT 3A was selected which is suitable for the age group 10-13 (Years 5 to Year 8) (<http://www.gl-assessment.co.uk/products/new-group-reading-test/test-detail>). The test items are 20 sentence completions, and four short passages for context comprehension and reading comprehension. The areas of assessment are vocabulary, grammatical knowledge, inference skills, ability to recognise, authorial intent and deduction skills. The test is adaptive, and therefore the difficulty level changes according to pupil's initial responses. The test has an online set-up and it has no time limits for completion of the test. However in practice, completion of the test was no more than 45 minutes for one school lesson.

Analysis

The analysis in this evaluation study is based on 'intention to treat', meaning that all pupils originally randomly allocated to one group or the other were tested and their outcomes analysed within that group, regardless of the time actually spent on the intervention. The impact of the trial is represented by the effect size (Hedges' g) for the difference between groups in the post-test only results of New Group Reading Test (NGRT 3-A). These were calculated both for the overall reading score and the standardised age score (SAS), yielding equivalent results in terms of effect sizes. Further analyses include finding the equivalent 'effect' sizes for only FSM-eligible pupils.

The security of the finding can be partly assessed by looking at what happens when counterfactual scores are added to either group, and calculating how many such scores could be added before the 'effect' size disappears (Gorard and Gorard 2015). This 'number needed to disturb the finding' (NNTD) is based on a counterfactual consisting of the mean KS2 score for the treatment group, and adding its standard deviation. The treatment counterfactual is used here because the control group is slightly smaller (and so is easier to 'disturb').

Accelerated Reader: The intervention

AR is a networked computer-based management programme intended to encourage pupils in independent book reading. The AR programme allows teachers to monitor pupils' reading levels and progress. Based on this information, the teacher's role is to support pupils in

making an appropriate selection of books for reading, and to motivate them in achieving advanced reading levels. AR has the following main features:

Standardised Test for Assessment of Reading (STAR)

STAR is a 20-minute screening test that determines each pupil's 'optimal' level of reading comprehension. The test includes vocabulary-in-context and other skill-based items. It is an adaptable assessment system that changes the question choices and level of challenges according to the pupil's prior responses. The STAR scores pupil's reading ability and generates a diagnostic report that includes percentile rank, National Curriculum Level in reading, reading age, estimated oral reading fluency and Zone of Proximal Development (ZPD: maximum ability to read and understand a book of a certain difficulty level). The diagnostic report also gives recommendations to the teacher on how to support the pupil for further improvement in reading. STAR can be conducted repeatedly and periodically to monitor pupil's progress. It is recommended on the Renaissance Learning Inc. website that teachers should conduct STAR three to five times in a year to follow pupil's gradual progress.

Advantaged/TASA Open Standard (ATOS) readability formula and book selection

ATOS is a measure of text difficulty created by Renaissance Learning Inc. The readability of a book is calculated taking into account the word count, average sentence length, average word length and word difficulty. There are over 160,000 books (fiction and non-fiction) available in the AR programme, allotted to bands on the basis of the ATOS readability formula. ATOS indicates the level of challenge in any book to be matched with a pupil's reading (ZPD) and their areas and levels of interest. ATOS measures only the readability level of books and does not take into account the literary merit, thematic construction, quality and complexity of ideas or maturity of the content. Areas of interest based on pupil age are suggested along with ATOS book levels in order to help make an appropriate book selection.

Independent reading

Once an appropriate book selection has been made, pupils are given time in school to read independently. AR recommends teachers motivate pupil to read regularly, and finish reading the selected book promptly. AR suggests 30 to 60 minutes of independent reading time every day.

AR quiz

There are around 156,000 quizzes in AR. These reading practice quizzes assess pupils' comprehension of the specific books they select to read. The format is generally multiple choice items that ask factual and inferential questions from the book. The quizzes are computer based and can be taken on laptop and tablets. Each pupil gets an individual login and password to have access to AR and complete the quiz. It is recommended that pupils take the AR quiz within 48 hours of finishing the book.

TOPS report and AR points

As soon as the quiz is completed the AR generates a TOPS report (The Opportunity to Praise Students) showing the results. The performance is intended to be monitored by a teacher, and if the pupil scored lower than 60% repeatedly then the teacher needs to both recheck the book selection and make different choices according to the ZPD. Pupils achieve AR points every time a quiz is passed, calculated on the basis of the ATOS readability level and word count of the book. The formula introduced by the developers of AR intervention (Paul et al. 1996) is:

- AR Points= (10+ ATOS readability level) x (words in book / 100,000)

The teacher can set an AR point goals for each pupil or for the whole-class group. The computer programme flags issues if pupils are not attaining the set targets or just selecting books to attain points rather than increasing the ZPD levels. Teachers are recommended to be innovative in giving rewards on achieving the targets such as certificates of achievement, gift vouchers, club membership, and announcements in the school assemblies.

As described above, AR is a developed intervention with clear methods of practice packaged with measures of pupils' progress at each stage of the intervention. The Renaissance Learning Inc. website is an important resource for teachers to consult and implement this intervention. There are various applications that Renaissance Learning Inc. regularly add in the AR programme and recommend teachers to integrate into AR. There are also staff training workshops offered by Renaissance Learning Inc.

How much did it cost?

The costs of AR include an annual subscription to the online resources that are available on the Renaissance Learning Inc. website. The schools buy an annual licence for each pupil involved. The cost varies depending upon adding extra feature to the AR programme. However, a minimum subscription rate for 50 pupils is £450 or an average of £9 per pupil per year. This gives access to the STAR reading assessment, 25,000 quizzes and features such as TOPS reports, other diagnostic reports, and book finders. One day teacher's training cost is included in the subscription licence and the schools also have access to a free hotline telephone service for instant information.

The cost for buying books and technology varies among schools. The schools involved in this project used a major part of the funds in purchasing laptops, iPads, tablets and books for the libraries. The cost for extra teaching assistant staff (for book banding and making book inventories) was also covered in the project budget for individual schools.

AR training in the schools was delivered by professional trainers. The training included a tour of the Renaissance Learning Inc. website through which pupils and teachers could access AR resources. The training covered all aspects of STAR testing and TOPS reporting with an explanation on how to interpret the results. Teachers, TAs and literacy coordinators who were planning to implement AR intervention attended the training. In all of the four schools a total of 15 staff members received training. The majority of participating schools had no previous experience of using AR.

The school leaders developed reward systems to encourage a culture of reading in their schools. This included setting up an after-school reading club, celebrating millionaire readers (who had read one million words), using symbols/medals/ badges for pupils who achieved the targets, a wall of fame for those who achieved 100% in quizzes, and Amazon gift vouchers to purchase books on completing the AR targets.

The impact of AR

In terms of their prior KS2 English points, the randomisation was successful in creating balanced groups at the outset (Table 2). This suggests that a post-test only analysis is

appropriate with no further consideration of prior attainment (Gorard 2013). This has the added benefit of allowing the analysis to include the four pupils with missing prior KS2 data (whose addition would not be able to unbalance the groups noticeably, whatever their scores had been).

Table 2 – Prior KS2 points in English, by treatment group

Group	N	KS2 points	Standard deviation	‘Effect’ size
Accelerated Reader	174	26.67	4.21	0
Control	161	26.64	4.00	-

Note: One treatment and three control pupils are missing KS2 scores. This can occur when they move from a school outside England or from the independent sector.

Considered in terms of the NGRT raw reading scores the treatment group is ahead of the control by about one quarter of a standard deviation (Table 3). The same result occurs if the standardised age scores are used instead. This scale of difference is considered by the EEF to be equivalent to around an extra three months’ reading age. Given the RCT design, this implies that AR has had a modest impact on the treatment group (Tables 3 and 4).

Table 3 - Overall post-test reading score, by treatment group

Group	N	NGRTA	Standard deviation	‘Effect’ size
AR	175	327.1	51.4	+0.24
Control	164	315.3	46.6	-

One way of assessing the security of this finding is to consider how different the scores would have had to have been for the ‘effect’ size to disappear (Gorard and Gorard 2015). If a score that is counterfactual to the control group is created by adding the mean and standard deviation of the treatment group (378.5), then it would take 32 such scores added to the existing control group to eliminate the effect size reported in Table 3. This ‘number needed to disturb’ (NNTD) of 32 is reasonably substantial, and considerably higher than the level of missing data. It suggests that the result is unlikely to have arisen by chance or as a result of bias created by attrition.

The difference is even more positive when only those pupils eligible for free school meals (FSM) are considered (Table 4). Although these figures do not have the force of a trial, because FSM-eligible pupils were not randomised to groups as such, it seems that AR does not widen the gap between pupils designated as poor and the rest, and may well act to reduce it. It must be recalled that this intervention was applied selectively, and the results are based on only pupils originally attaining Level 4c or below at KS2 English. Therefore, there is evidence overall that AR improves reading for new Year 7 pupils with weak reading skills and habits, and that it does so especially for those eligible for FSM.

Table 4 - Overall reading score, FSM-eligible pupils

Group	N	NGRTA	Standard deviation	‘Effect’ size
AR	56	319.9	42.4	+0.38
Control	59	303.9	41.1	-

Reported outcomes of the intervention

The schools were closely followed in order to observe the process of AR implementation, and teachers' and pupils' feedback obtained. The school visits were conducted from the outset when the intervention was introduced, and when the project was nearing the end (a total of eight visits, observing several classes on each visit – and four further meetings with staff and school research leads). During these two time periods the visits involved interviews and observation of the AR sessions. Interviews with teachers were light-touch conversations in the school staff room or other convenient area. The pupils were approached in the same way and were engaged in informal talk on reading books, favourite authors, watching TV and films, book selection process and AR quizzes and rewards. The reasons for this very informal and unsystematic method were to keep the evaluation non-intrusive and easy for the teachers and pupils to participate in. Hand written field notes and visit reports were developed by the researchers and these were shared with each other to reflect and filter some common themes and issues. The following sections present some of the findings derived from the field visits, interaction with teachers and literacy coordinators, and conversations with the pupils.

As observed in the schools participating in the trial, the ones which had been using AR previously were more practised in using the full range of features in AR. However, the two schools new to the AR intervention adopted the basics and slowly began using extra features. Overall, schools were observed to be implementing faithfully.

The intervention relies on technology (computers or tablets), the internet and a full library. The schools bought more books with funding for this trial. The schools in the trial increased the number of books in the libraries and banded the book stocks according to their ATOS readability level. The schools using AR also needed to have a regular subscription to the Renaissance Learning Inc. website through which pupils could take the STAR tests and quizzes, and teachers could find books or download pupils' diagnostic reports. In this subscription licence teachers had access to technical support and they could also exchange information with other AR schools.

Two of the schools purchased tablets to make the AR quiz time a more fun activity for pupils, with enough for each child in a small group to use one each. In one of the schools pupils were doing their independent reading every day for 40 minutes after school time. In two of the schools pupils were taken out of French and other language lessons, while in the other they were mainly taken from English. The library space was mainly used for the independent reading time and for taking the AR quizzes. Pupils were also encouraged to take the books and read at home.

School leaders told us that they observed pupils gradually improving in their STAR performance. They thought that pupils having exposure to the books of interest and appropriate readability had brought this improvement in pupil's reading levels. It was also perceived by the teachers that attaining AR points and setting targets was itself a motivation for the students, so an external reward for achievement may not really have any deeper impact. This point of view was not the same among all teachers who used AR because some also believed that extrinsic reward played an important role in encouraging the readers at low levels, and in the first instance.

School leaders suggested that monitoring and advising pupils helped their confidence to take up a reading challenge. Pupil with low reading levels initially believed that finishing a book was almost impossible and that they would fail in the quiz. In some cases they were even

reluctant to select a book for independent reading. However, teacher's advice and motivation strategies helped these pupils to achieve the reading targets. The teachers reported that the success of these pupils was very rewarding for themselves as well as for the pupils.

In terms of AR implementation during the transition from primary to secondary school one of the school leaders reported that it was not the appropriate timing for some of their pupils to be introduced to AR (they did not specify how many). Pupils coming from primary schools needed support from teachers to adjust to the new format of secondary schooling. Facing them with AR, in addition, could be a challenge at this beginning stage of a secondary school experience.

Some of the pupils reported that they had been asked to select a book for reading and if they had the choice they would not have selected and read any book. Their choice was guided by the teacher and they personally had no interest in reading books. They found reading books a dull and boring activity. Some pupils also said that reading lengthy books put them off reading so they chose smaller books for their reading targets. One of the pupils said that he liked just looking at pictures in the books rather than reading the text so whenever he selected any book he made sure it had more pictures than text. Some pupils were more attracted to books with bold images rather than books with just plain text. It is possible that pictures and images helped pupils in understanding.

Some teachers believed that completing AR quizzes was as much a test of memory as of pupil's comprehension. They thought that pupils who had good memory and concentration levels scored higher than those who could not memorise details or those who had a short concentration span while doing a screen test.

AR is a quite well-known intervention in schools and some parents had already known about AR before their child's participation. Some of those who already knew about AR were very enthusiastic for their children to participate. It was also noted that some parents became aware of the importance of having books for their child's interest in the home, once their children participated in AR.

The AR attendance records showed that pupils were attending the sessions regularly. Although many had to come from regular classes and some even had to stay after school, the overall AR attendance record was very good. During observations and interviews, pupils reported that they liked coming for AR because there was no teaching and they would get a chance to do a quiz using the tablets. Some of them also reported that they preferred AR sessions rather than regular classes which they found boring.

Formative findings

All participant schools were visited by the researchers in order to achieve an in-depth view of AR practice. These findings emerged from what was reported by the pupils, teachers and school leader along with what evaluators observed during the observation visits in the schools where the intervention was carried out. These findings are not conclusive but provide useful information based on pupils and practitioners experiences.

Administration of AR

Several teachers and literacy coordinators reported that conducting AR requires a lot of administrative work such as colour coding and banding of books, monitoring pupils and

advising them on book selection, and following STAR reports for individual pupils and the whole class. It is not clear that this is more work than would be required for standard classes, or whether it was simply additional and new for this intervention. The programme requires space in school planning for the timetable just as given to other subjects.

Timings for AR

Schools using AR need to incorporate at least 40 minutes in the timetable so that pupils on the intervention do not have to miss other lessons. AR is difficult to adopt in regular teaching of subjects other than English. However, pupils always had the choice of selecting books that were non-fiction or relevant to other subjects such as Geography, History and other science subjects.

Pupils with very low reading ability

The AR protocol does not say if teacher's instruction can be involved for pupils at very low reading levels. Independent reading for these pupils is initially frustrating. Teachers said that it is too much to expect them to read complete books and pass the quizzes if pupils do not have basic reading skills such as word recognition, reading fluency and a bit of awareness to decode the text. If these readers with very low reading levels are to use AR then there must be some scope or advice on initial teacher tutoring lessons for them. Peer tutoring is one of the recommended strategies in the AR process. However, the schools judged that for the readers who struggle to decode simple words it is unrealistic to expect improvement through either independent reading or peer tutoring.

AR quiz challenge

School leaders and teaching staff suggested that the AR quizzes need to be made more challenging in order to overcome doubts about whether pupils have read the books independently and not sought the answers from other resources. Collaboration is also possible among a group of pupils who share knowledge of specific books and the quiz. It was suggested that if a book had more than one quiz available then it could also reduce the chances of cheating.

Writing tasks

AR mainly targets reading comprehension but there is a scope to add writing tasks in the intervention. AR quizzes are always multiple choice questions, but teachers felt that if there were small writing activities as well the intervention could have been more effective.

Conclusions

Limitations of the study

The schools participating in the trial had volunteered to conduct the AR intervention themselves. The schools are therefore not necessarily a representative sample of a larger population in their areas.

The randomisation was done within the schools and pupils in both arms of the trial continued regular activities in the school other than AR sessions. However, students in the treatment group were taken out of the regular classes for AR. There is a minimal danger of treatment diffusion to the pupils in the control group.

In one of the schools the randomisation was by classes rather than eligible individuals. This is a shame as it reduces comparability, but there is no reason to suspect that this has influenced the results, and the impact was similar across all schools.

The design adopted for this trial cannot reveal any long-term impact of this intervention. Once the post-tests were completed after 20 weeks of the trial, the control group received the intervention. There is no ‘clean’ long-term control opportunity to follow AR pupils and see if they continued their attitude, interest and performance in independent book reading.

AR developers were not involved in this evaluation which means that there was no conflict of interest. However, there is a possibility that school leaders’ enthusiasm to take part in a funded research project resulted in a kind of ‘Hawthorne’ effect. The schools volunteered to conduct AR for the purpose of evaluation but all of them had already decided to do so because they felt that AR was a very good intervention.

NGRT is a computerised screen-test which adapts the level of challenge according to pupil’s initial responses. AR quizzes and STAR test are also screen tests. This familiarity might conceivably have given a practice advantage in the post-test to the treatment group.

Implications for practice

The headline finding, coupled with the low attrition and initial balance between groups, is that Accelerated Reader is a modestly successful approach for pupils in the transition phase of primary to secondary school. The trial is medium in scale, but as shown in the background discussion it is the largest true RCT conducted with AR in the UK. AR was at least equally effective for FSM-eligible pupils and so could be part of any attempt to reduce the poverty gradient in literacy on transfer to secondary school. The estimated cost of using AR for one year is £9 per pupil assuming that staffing, access to internet and most importantly a wide range of books are already available. AR may be harder to implement with pupils with very low initial reading levels. These pupils may need some preparation of a more formal nature. Other than that, AR can be used with all abilities and with individuals or whole classes. An effectiveness trial on a larger scale would be a useful next step.

Two further questions that it would be useful to address are:

What is the ‘active’ ingredient of AR?

There are six key steps involved in the AR process which involved STAR assessment, teacher’s advice and monitoring to pupils, book selection, independent book reading by pupil and pupil taking the quiz. What is the most effective element of this whole process? Is it regular independent reading time? Does it depend on pupils using online quizzes? Or is it the atmosphere of whole-group book reading competition that motivates pupils to read? Would any regime of reading books and completing quizzes give similar results or is it just using the Renaissance Learning Inc. recommended books and quizzes that are responsible for this impact?

Do pupils become lifelong readers?

One of the claims of AR is that pupils inculcate the habit of regular reading after using AR. There is a question of how long the impact of AR persists. A longer-term study is possible.

Implications for teachers as researchers

The schools have demonstrated that they can implement a new intervention without developer assistance. School leaders had the freedom to make decisions regarding training the TAs, arranging venues if their own choice for the intervention, purchasing materials, choice of equipment, timings and class adjustment without any developer's direct involvement. This lack of developer intervention was a considerable advantage, freeing schools and the evaluators from the pressure to demonstrate success experienced in other funded trials so far. This independence was partly possible because AR is a fully developed intervention and also supported thorough accessible online content.

More importantly, the schools also led much of the evaluation of their own intervention, including randomisation, data collection, testing and some analysis. To prepare for this they all took part in two day-long workshops organised by the independent evaluators. The first concerned RCT design, agreeing a timetable, the process of identifying eligible pupils, and randomisation to groups. The second concerned the importance of 'blind' testing and how to calculate 'effect' sizes. Participants were keen to attend and reported that the days had been very useful. The independent evaluators monitored and observed the schools in all parts of the trial. There were no major concerns, even with the randomisation. The independent evaluators main role in the impact assessment was to aggregate the results from all schools.

The advantages of schools running their own trials could be lower cost, easier permission to innovate, and less dropout. The training helps teachers to consume other evidence critically. Not having a developer involved assists by not introducing pressure to succeed. And having pupils randomly allocated within schools reduces post-allocation demoralisation, and keeps all schools involved throughout since all are both treatment and control schools. These results are very similar to those drawn in a parallel aggregated trial of a phonics intervention led by the same authors (Gorard et al. 2015). Schools can run their own trials with appropriate guidance, and other bodies can aggregate the results to create findings with sufficient scale to be taken seriously.

Acknowledgements

This work was funded by the Educational Endowment Foundation.

Endnote

A full report of this study for a practitioner audience is available at:
<https://educationendowmentfoundation.org.uk/projects/accelerated-reader/>

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